

# **A STRATEGY TO REDUCE THE MERCURY CONTENT OF PRODUCTS**

## **Report to the Joint Standing Committee on Natural Resources**

### **January 2003**

#### **I. Reporting requirement**

In April 2002, Governor King signed *An Act to Phase Out the Availability of Mercury-added Products*.<sup>1</sup> Section 1 of the Act prohibits the sale of mercury-added thermostats for most residential and commercial applications beginning January 1, 2006. Section 2 requires the Commissioner of Environmental Protection to prepare a strategy to reduce the mercury content of other products. Specifically, the commissioner is directed to submit a report that includes the following:

- A summary of data submitted by manufacturers of mercury-added products pursuant to 38 MRSA § 1661-A [prohibiting the sale of mercury-added products after January 1, 2002 unless the manufacturer has disclosed the amount and purpose of the mercury];
- A comprehensive strategy to reduce the mercury content of products; and
- Any legislation necessary to implement the strategy.

#### **II. Review of mercury product data**

Appendix A of this report summarizes the data submitted pursuant to 38 MRSA § 1661-A. This provision of Maine law prohibits the sale of most mercury-added products unless the manufacturer has filed written notification disclosing the amount and purpose of the mercury.

Maine is one of four northeast states that have adopted this notification requirement. The others are Connecticut, New Hampshire and Rhode Island. As authorized under 38 MRSA § 1671, the Maine Department of Environmental Protection (herein "DEP" or "department") has joined with these states in establishing the Interstate Mercury Education and Reduction Clearinghouse (IMERC) to coordinate receipt of the notification information. Manufacturers of mercury-added products may file the required information with IMERC and thereby avoid the need to file separately in each state. IMERC is operated under the auspices of the Northeast Waste Management Officials Association.

The summary data in Appendix A show that switches, relays and measuring devices account for the majority of mercury used in product manufacturing. While the department believes the totals in Appendix A understate the actual amount of mercury used due to underreporting, the relative proportions of mercury use among the product categories are consistent with other published estimates. In addition, the amount of

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<sup>1</sup> A copy of this bill can be downloaded from [http://janus.state.me.us/legis/ros/lom/LOM120th/4Pub601-650/Pub601-650-19.htm#P622\\_115591](http://janus.state.me.us/legis/ros/lom/LOM120th/4Pub601-650/Pub601-650-19.htm#P622_115591).

mercury in individual switches, relays and measuring devices typically is higher than comparable amounts in other product categories such as lamps and button cell batteries. As discussed below, the department proposes that the Legislature focus the next phase of mercury product reduction efforts on these three product categories.

The IMERC database was not the only source of information used in developing the mercury reduction strategy requested by the Legislature. The department took several other steps to gather information regarding mercury products and the availability of non-mercury alternatives.

First, the department wrote each manufacturer who had filed with IMERC as of May 1, 2002 and invited them to submit the following additional information:

- Their plans (if any) for reducing or phasing out the use of mercury;
- Information bearing on the availability, feasibility and affordability of non-mercury alternatives to the product;
- The public health, environmental or other societal benefits (if any) of continuing to use mercury in the product; and
- Any other information believed to be relevant to the development of a strategy to reduce the mercury content of products.

Twenty-eight manufacturers responded to this inquiry by providing additional information on their efforts to phase out the use of mercury products.

Second, the department hired the Lowell Center for Sustainable Production (LCSP) to undertake an independent investigation of alternatives to mercury-added products. The objectives of the LCSP study were to:

- Investigate the IMERC data and other mercury product information in the public domain;
- Identify priority products for investigation of non-mercury alternatives;
- Identify non-mercury alternatives to the priority products; and
- Conduct a qualitative evaluation of viable alternatives, including their cost and performance.

LCSP submitted a draft report of its investigation in October 2002. In general, LCSP found that functionally equivalent non-mercury alternatives are available at comparable cost for most mercury-added measuring devices, switches and relays. Measuring devices include instruments such as barometers, flow meters, thermometers and sphygmomanometers (blood pressure cuffs). Switches include tilt switches, float switches, pressure switches and temperature switches used in a variety of industrial settings and products. LCSP focused its study on these products based on a priority setting process that

considered the amount of mercury in the products, their relative contribution to reported mercury releases, and the availability of non-mercury alternatives.

During November 2002, the DEP provided the draft LCSP report and proposed mercury reduction strategy to the Mercury Products Advisory Committee<sup>2</sup> and over 200 other potentially interested parties. In a cover letter to the draft report, the department invited reviewers to comment on the following:

- The findings and conclusions regarding any or all of the mercury products investigated by LCSP;
- Any products or data gaps that warrant further investigation; and
- Whether a mercury reduction strategy banning the sale of most new mercury-added measuring devices, switches and relays would result in hardships or consequences for particular users or industries.

Written comments received through December 31, 2002 were forwarded to LCSP for consideration in preparing its final report [[link to LCSP final report](#)].

### **III. Strategy for mercury reduction**

Based on LCSP's findings, the DEP proposes a mercury reduction strategy that prohibits the sale of most new mercury measuring devices and most new products containing mercury switches or relays. However, consistent with LCSP's findings, the department is not proposing to apply the prohibition to sales of thermostats used in manufacturing applications, or where the use of a mercury product is required by federal law. The prohibition also would not apply where a federal agency requires the use of a mercury product by contract specification.

LCSP observed that complications can arise when replacing mercury switches and relays in existing machinery and equipment. In some instances, the switch or relay is embedded or integrated in an existing application such that available non-mercury alternatives cannot be easily retrofitted into the product when the mercury switch or relay wears out. Accordingly, the department proposal will allow the sale of new mercury switches and relays for replacement parts in manufacturing equipment, or in non-manufacturing applications where the switch or relay is not physically separate from other components of the larger product.

Determining how to appropriately address the replacement issue was the most challenging aspect of preparing this strategy. In fashioning an appropriate approach, the department had to balance the information presented by LCSP with important administrative factors, such as resource limitations at the department and the regulated community's need for clarity and predictability. For example, by generically applying the replacement exemption to all manufacturing applications, the department understands that there may be instances where replacement of mercury switches or relays in manufacturing

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<sup>2</sup> DEP and LCSP staff later met with the Mercury Products Advisory Committee on December 13, 2002 to discuss the report findings. The 13-member committee advises the department and Legislature on actions to prevent and reduce environmental releases of mercury from consumer products. See 38 MRSA § 1670.

equipment with non-mercury alternatives is both possible and desirable. On the other hand, the department would prefer to focus its resources on replacement questions involving equipment that typically is sold in large numbers in off-the-shelf applications (e.g., marine bilge pumps) rather than on a case-by-case review of unique equipment configurations.

The department proposes that the sales prohibition be made effective beginning July 1, 2006, which coincides with the effective date of a Connecticut ban on sales of mercury-added products.<sup>3</sup> This will give consumers and manufacturers three years to make the appropriate adjustments and seek an exemption if warranted.

An exemption process will be available to address mercury flame sensors,<sup>4</sup> some relay applications<sup>5</sup> and unforeseen instances where technically feasible non-mercury alternatives are not available at reasonable cost. Legislation already enacted in Rhode Island and Connecticut allows manufacturers of mercury-added products to obtain an exemption from sales prohibitions in those states upon assurance that a system exists for the proper collection and management of the products at the end of their useful life.<sup>6</sup> The DEP proposes similar exemption criteria in Maine to ensure the proper collection of exempt products and promote consistency with mercury reduction initiatives in other states.

According to available sources, the products targeted by this proposed legislative strategy--measuring devices, switches and relays--account for most U.S. domestic use of mercury in products other than dental amalgam. In choosing not to investigate or evaluate alternatives to mercury amalgam as part of this effort, the department took note of recent Legislative action regarding the use of mercury in dental procedures.<sup>7</sup> However, as a separate matter, the department is recommending legislation that requires the use of amalgam separators to reduce mercury releases from dental offices.

With respect to other mercury-added products not addressed by this strategy or prior legislation,<sup>8</sup> the department believes it is premature to reach a final decision regarding

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<sup>3</sup> 2002 Connecticut Public and Special Acts, No. 02-90, section 6(a).

<sup>4</sup> Mercury flame sensors are used in some gas appliances to shut off gas flow if the pilot light is out. Most gas appliances are available with nonmercury electronic ignition systems that eliminate the need for a pilot light. Electronic ignition systems, however, are not a safe alternative if the appliance is intended for use in areas where electrical service is intermittent or unavailable. See "An Investigation of Alternatives to Mercury Containing Products," Lowell Center for Sustainable Production, January 2002, pp. 64 and 65.

<sup>5</sup> LCSP concluded that nonmercury relays are available for most but not all applications. LCSP, p. 68.

<sup>6</sup> 2002 Connecticut Public and Special Acts, No. 02-90, section 7(e); Rhode Island General Law 23-24.8-7(g).

<sup>7</sup> See 38 MRSA § 1667 directing the Department of Environmental Protection to develop a pollution prevention plan for mercury from dental procedures. See also 32 MRSA § 1094-C directing the Department of Human Services to develop a brochure explaining the advantages and disadvantages of using mercury amalgam and directing dentists to distribute the brochure to their patients.

<sup>8</sup> See 38 MRSA § 1661-C, sub-§ 1 banning the sale of mercury fever thermometers; 38 MRSA § 1661-C, sub-§ 2 banning the sale of mercury manometers for use in milking machines; 38 MRSA § 1661-C, sub-§ 5 banning the sale of mercury-added thermostats; and 38 MRSA § 1665-A, sub-§ 1 banning the sale of automobiles that contain mercury switches.

how best to proceed. First, the department did not investigate the availability of non-mercury alternatives for all mercury-added products because of the resource-driven need to set priorities that narrowed the scope of the LCSP investigation. Second, the Connecticut Department of Environmental Protection is required by law to investigate products containing less than 100 milligrams or 50 parts per million of mercury and make recommendations regarding their regulation by July 1, 2004.<sup>9</sup> Maine can benefit from Connecticut's work when evaluating the need for further action in the remaining product categories. Third, additional time may prove beneficial in the identification of non-mercury alternatives as these technologies advance in the coming years, such as in the lighting category.

#### **IV. Implementing legislation**

Appendix B sets forth proposed legislation to implement the mercury reduction strategy outlined in section III.

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<sup>9</sup> 2002 Connecticut Public and Special Acts, No. 02-90, section 6(b).

## **APPENDIX A**

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### **SUMMARY OF MERCURY PRODUCT NOTIFICATION DATA**

This appendix summarizes data on mercury in products submitted to the Interstate Mercury Education and Reduction Clearinghouse (IMERC). Through calendar year 2002, IMERC had received 221 notification filings. Of these filings, 188 were determined to be sufficient for inclusion in this summary.

#### **IMPORTANT NOTES and CAVEATS:**

- The data is for products sold in the United States in calendar year 2001.
- Some manufacturer filings remain under review by IMERC and have not been included in this summary. In addition, there may be other manufacturers who have not yet filed with IMERC. For these reasons, the mercury totals for a number of products or product categories likely are understated.
- Several manufacturers that make products containing a mercury-added component deferred to the component manufacturer for information on the amount of mercury in the component. These products are not listed separately in the tables below. This is because it is not possible to ascertain how much mercury these products contain, either because the component manufacturer has not filed with IMERC or because the information filed by the component manufacturer does not identify each particular product or manufacturer that uses the component.
- Some of the data included in this summary has not been subjected to the full IMERC QA/QC process that is followed prior to presentation on the IMERC publicly accessible data base.

The data in the following tables are organized in two sections. Section I lists products (e.g., a switch or a lamp) sold either as a discrete item or for use as a component in a larger product. Section II lists larger products (e.g., a motor vehicle or appliance) that contain a mercury-added component. The mercury totals in section I by component manufacturers do not correspond to totals in the section I due to non-reporting (in some cases substantial) by manufacturers of both types of products.

## Section I: Mercury-added products

**Table I-1. Total mercury in products sold during calendar year 2001**

Product	Total mercury	Percent of total
Switches <sup>1</sup>	31,947 pounds	21
Relays	62,237 pounds	41
Measuring devices <sup>2</sup>	8,044 pounds	5
Lamps <sup>3</sup>	18,002 pounds	12
Button cell batteries <sup>4</sup>	4,005 pounds	2
Dental amalgam <sup>5</sup>	26,819 pounds	18
Laboratory/ test reagents	81 pounds	<1
Other <sup>6</sup>	10 pounds	<1

**Total for all products: 151,145 pounds**

<sup>1</sup> Not all switch manufacturers have reported and one manufacturer was unable to separate US sales figures from all sales data. Switches include tilt switches, reed switches, vibration switches, flame sensors, etc.

<sup>2</sup> Measuring devices include manometers (771 pounds), sphygmomanometers (4,001 pounds), and thermometers (3,271 pounds).

<sup>3</sup> Lamps include linear fluorescent (14,223 pounds), high intensity discharge (2,734 pounds), compact fluorescent (618 pounds) and specialty lamps (427 pounds).

<sup>4</sup> Button cell battery types include zinc air (2,913 pounds), alkaline manganese (550 pounds) and silver oxide (542 pounds).

<sup>5</sup> One manufacturer reported.

<sup>6</sup> Products in this category include film, diagnostic devices, gas plasma screens, etc.

**Table I-2. Amount of mercury per component<sup>1</sup>**

<b>Product</b>		<b>Grams of mercury<sup>2</sup></b>
<b>Switches</b>	<b>Tilt switch</b>	<b>0.5 to 4</b>
	<b>Float switch</b>	<b>0.9</b>
	<b>Flame sensor</b>	<b>1.7</b>
<b>Relays</b>	<b>Computer wetted relay 1 to 5 amps (1 to 4 poles per unit)</b>	<b>0.01 to 18 per pole</b>
	<b>35 to 60 amp relays (1 to 3 poles per unit)</b>	<b>55 per pole</b>
	<b>100 amp relay (1 to 3 poles per unit)</b>	<b>153 per pole</b>
<b>Measuring devices</b>	<b>Manometers</b>	<b>74</b>
	<b>Sphygmomanometers</b>	<b>104.2 to 124.5</b>
	<b>Thermometers</b>	<b>0.45 to 54</b>
<b>Lamps</b>	<b>Fluorescent lamps</b>	<b>0.0014 to 0.09<sup>3</sup></b>
	<b>Compact fluorescent lamps</b>	<b>0.0009 to 0.025</b>
	<b>High intensity discharge lamps</b>	<b>0.0009 to 1.075</b>
	<b>Specialty lamps</b>	<b>0.00055 to 5.5</b>
<b>Button cell batteries</b>	<b>Alkaline manganese</b>	<b>0.000006 to 0.017</b>
	<b>Silver oxide</b>	<b>0.00074 to 0.01627</b>
	<b>Zinc air</b>	<b>0.0013 to 0.0248</b>

<sup>1</sup> The numbers reflect only those manufacturers who reported an exact amount of mercury per product unit or provided enough information to determine the upper and lower amount of mercury in a single unit of the product.

<sup>2</sup> 454 grams = one pound.

<sup>3</sup> In a December 2001 report titled "Maine Fluorescent Lamp Study", the Maine Department of Environmental Protection reported mercury amounts ranging from 0.00275 to 0.00476 grams per lamp based on laboratory analyses of a random sample of new 4-foot linear fluorescent lamps. Veritech Laboratories, Inc. of Fairfield, New Jersey conducted the analyses for the department.



## Section II: Products using mercury-added components

**Table II-1. Products that use mercury SWITCHES**

Product	Mercury (lbs)
Thermostats (all applications) <sup>1</sup>	28,506
Tamper/tilt switches in meters (gas/electric/water)	7,053
Motor vehicles <sup>2</sup>	3,936
Portable heaters	1,471
Ovens	1,100
Pumps with float switches (marine, septic, industrial uses, etc.) <sup>3</sup>	818
Recreational vehicles ovens <sup>4</sup>	372
Recreational vehicles leveling jacks <sup>4</sup>	34
Glass breakage sensors	11
Telecommunication circuit boards	4
Portable radio man-down switch	0.8
Electric trailer braking controls	0.2

**TOTAL: 43,306 pounds**

<sup>1</sup> The IMERC data is unclear as to whether thermostat manufacturers purchase or manufacture the mercury switches used in thermostats.

<sup>2</sup> Automobile manufacturers have eliminated the use of switches in 2003 model year vehicles.

<sup>3</sup> This number includes companies that may manufacture float switches as well as the pumps containing the float switch.

<sup>4</sup> Several recreational vehicle (RV) manufacturers provided data on total mercury use but did not segregate the total by component; others deferred to the component manufacturer for information on total mercury use. RVs can have several mercury-added components (e.g., flame sensors in gas ovens; fluorescent lamps; mercury switches for automated leveling).

**Table II-2. Products that use mercury RELAYS**

Product	Mercury (lbs)
Commercial oven runaway control	6328
Relay in frialators <sup>1</sup>	274

**TOTAL: 6,602 pounds**

<sup>1</sup> One manufacturer reported.

**Table II-3. Products that use mercury LAMPS<sup>1</sup>**

<b>Product</b>	<b>Mercury (lbs)</b>
Computer equipment	83
Office equipment (multifunction devices, fax machines, printer, copiers, scanners, etc.)	76
Cameras, camcorders, etc.	45
Motor Vehicles	13
Commercial and household appliances (refrigerators, ranges, vacuum cleaners, sewing machines, etc.)	12
Products with LCD displays (miscellaneous products such as work station, e-book readers, musical keyboards, digital mixers, sequencer, digital keyboards, cash registers)	10
Measuring devices (test devices for voice distortion/levels for car auto, DVD and video equipment, oscilloscopes, logic analyzers, protocol analyzers, communication analyzers, video test equipment, waveform generators, signal generators)	7
VCRs, DVD players, radios	5
Microscopes	5
Spare and replacement parts	3
Recreation Vehicles	2
TVs	2
Industrial/Manufacturing Equipment	2
Medical equipment	0.5
Miscellaneous products (broadcasting/studio equipment, avionics electronic equipment, digital picture frame)	0.1

**TOTAL: 262.6 pounds**

<sup>1</sup> Several manufacturers that incorporate lamps in their final products deferred to the manufacturer of the lamp component for information on total mercury use. This table does not include mercury totals for these manufacturers.

**Table II-4. Products that use mercury BATTERIES<sup>1</sup>**

<b>Product</b>	<b>Mercury (lbs)</b>
Watches/Clocks	118
Toys/Novelties	90
Digital Thermometers	5

**TOTAL: 213 pounds**

<sup>1</sup> This data is incomplete. Some manufacturers that use button cell batteries in their products have filed with IMERC but the filing is incomplete; numerous others have not yet filed any information on their mercury use.

**Table II-5. Products with MISCELLANEOUS MERCURY COMPONENTS**

<b>Product</b>	<b>Mercury (lbs)</b>
Color proofing laminator (slip ring device; high current handling mercury wetting to avoid arcing)	6
Semiconductor- electrical characterization measurements	3
Film (professional, medical and specialized motion picture film)	0.7
In-vitro diagnostic device	0.13
Aircraft gas plasma display screens	0.06
Scientific analyzers	0.05
Wireless transceiver (chipset used for cell phones and pagers)	0.04
Dribath	0.009
Cold patch on vitreous china plumbing fixtures (i.e.: toilets)	0.004

**TOTAL:****10 pounds**

## APPENDIX B - PROPOSED IMPLEMENTING LEGISLATION

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### An Act to Reduce Mercury Use in Measuring Devices and Switches

Be it enacted by the People of the State of Maine as follows:

**Sec. 1. 38 MRSA § 1661, sub-§ 3-A,** is enacted to read:

**3-A. Mercury relay.** “Mercury relay” means a mercury-added product or device that opens or closes electrical contacts to effect the operation of other devices in the same or another electrical circuit. The term includes mercury displacement relays, mercury wetted reed relays and mercury contact relays.

**Sec. 2. 38 MRSA § 1661, sub-§ 4,** as enacted by PL 2001, c. 656, §1, is repealed.

**Sec. 3. 38 MRSA § 1661, sub-§ 4-A,** is enacted to read:

**4-A. Mercury switch.** “Mercury switch” means a mercury-added product or device that opens or closes an electrical circuit or gas valve. The term includes mercury float switches actuated by rising or falling liquid levels, mercury tilt switches actuated by a change in the switch position, mercury pressure switches actuated by a change in pressure, mercury temperature switches actuated by a change in a temperature, and mercury flame sensors. The term mercury switch does not include a mercury-added thermostat.

**Sec. 4. 38 MRSA § 1661-C, sub-§ 5,** as enacted by PL 2001, c. 620, §1, is amended to read:

**5. Mercury-added thermostats.** After January 1, 2006, a person may not sell or offer to sell or distribute for promotional purposes a mercury-added thermostat except ~~for a thermostat used for manufacturing or industrial purposes and except~~ for a thermostat used by a blind or visually impaired person. A manufacturer of mercury-added thermostats may apply to the commissioner prior to January 1, 2003 for an exemption from the provisions of this subsection for one or more specific uses of a mercury-added thermostat. The Commissioner of Environmental Protection may grant an exemption with or without conditions upon finding that:

**A.** The manufacturer has demonstrated that a system exists for the proper collection, transportation and processing of the mercury-added thermostat at the end of its life; and

**B.** The specific use or uses of the mercury-added thermostat provide a net benefit to the environment, public health or public safety when compared to available nonmercury alternatives.

For the purpose of this subsection, a “mercury-added thermostat” means a product or device that uses a mercury switch to sense and control room temperature through communication with heating, ventilating or air conditioning equipment. The term includes thermostats used to sense and control room temperature in residential, commercial, industrial and other buildings but does not include a thermostat used to sense and control temperature as part of a manufacturing process.

**Sec. 5. 38 MRSA § 1661-C, sub-§ 6, 7 and 8,** are enacted to read:

**6. Instruments and measuring devices.** Effective July 1, 2006, a person may not sell or offer to sell or distribute the following mercury-added products:

- A. A barometer;
- B. An esophageal dilator, bougie tube or gastrointestinal tube;
- C. A flow meter;
- D. A hydrometer;
- E. A hygrometer or psychrometer;
- F. A manometer other than a manometer prohibited from sale under subsection 2;
- G. A pyrometer;
- H. A sphygmomanometer; or
- I. A thermometer other than a thermometer prohibited from sale under subsection 1.

This subsection does not apply to the sale of a mercury-added product listed in paragraphs A through I if use of the product is required under federal law or federal contract specification, or if the only mercury-added component in the product is a button cell battery.

**7. Mercury switches and relays.** Effective July 1, 2006, a person may not sell or offer to sell or distribute a mercury switch or mercury relay individually or as a product component. This prohibition does not apply if the switch or relay will be used to replace a switch or relay that is a component in a larger product in use prior to July 1, 2006 and one of the following applies:

- A. The larger product is used in manufacturing; or
- B. The switch or relay is integrated and not physically separate from other components of the larger product.

This subsection does not apply to the sale of a mercury switch or mercury relay if use of the switch or relay is required under federal law or federal contract specification.

**8. Exemptions.** Subsections 6 and 7 do not apply to the sale of a mercury-added product for which an exemption is obtained under this subsection. The manufacturer or user of the product may apply for an exemption by filing a written petition with the commissioner. The commissioner may grant an exemption with or without conditions upon finding that:

**A.** A system exists for the proper collection, transportation and processing of the product at the end of its life; and

**B.** One of the following applies:

(1) Use of the product provides a net benefit to the environment, public health or public safety when compared to available nonmercury alternatives; or

(2) Technically feasible nonmercury alternatives are not available at comparable cost.

Prior to approving an exemption, the commissioner shall consult with neighboring states, by means of the clearinghouse under section 1671 or otherwise, to promote consistency in the way in which mercury-added products are regulated. Exemptions may be granted for a term not to exceed 5 years and may be renewed upon written application if the commissioner finds that the mercury-added product continues to meet the criteria of this subsection and the manufacturer or other persons comply with the conditions of its original approval. The board shall adopt rules for processing exemption applications that provide for public participation, taking into account the role of the interstate clearinghouse. Rules adopted under this section are routine technical rules pursuant to Title 5, chapter 375, subchapter II-A.

## SUMMARY

The bill bans the sale of mercury switches, mercury relays, and certain mercury-added measuring devices and instruments effective July 1, 2006. The ban does not apply to sale of mercury switches or mercury relays that will be used as replacement parts in existing manufacturing equipment or in other equipment or machinery in which the switch or relay is integrated with other components. Manufacturers and users of the targeted mercury-added products may apply to the Commissioner of Environmental Protection for an exemption from the sales prohibition.

The bill also clarifies the scope of the prohibition on sale of mercury-added thermostats enacted by Public Law 2001, chapter 656, section 1.